P2.15 **LEON THE LIGHTNING SAFETY LION SAYS: "*WHEN THUNDER ROARS – GO INDOORS*!" - NOAA's EFFORTS REGARDING CHILDRENS LIGHTNING SAFETY**

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1. INTRODUCTION

Although lightning fatalities continue to decrease in the United States (Fig 1), lightning continues to be one of the leading causes of weather fatalities (Fig 2). In order to continue this downward trend, the National Oceanic and Atmospheric Administration (NOAA) and the Lightning Safety Community have been actively involved in lightning safety education (Jensenius and Franklin 2006, Jensenius et. al. 2008). This paper will discuss these educational activities with an emphasis on childrens lightning safety.

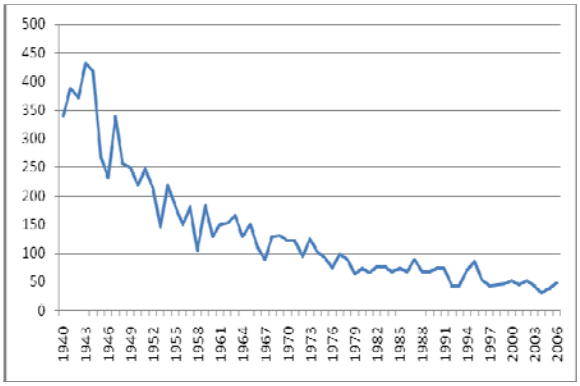

Figure 1. Lightning fatalities for the United States from 1940 through 2006 (NOAA 2007).

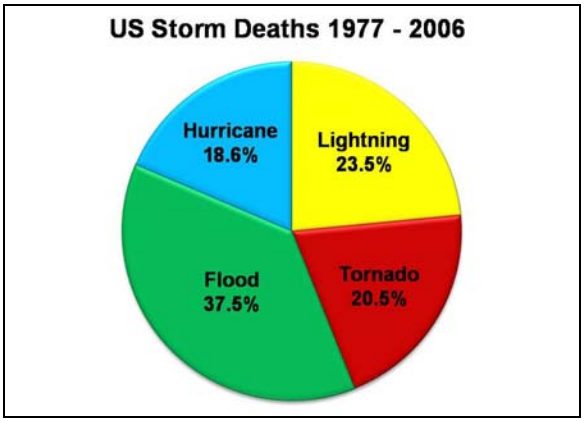

Figure 2. Weather related deaths in the US (1977-2006) by weather phenomena. Lightning is the 2nd leading cause of storm deaths over this 30 year period (NOAA 2007).

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2. LIGHTNING SAFETY – A COLLABORATIVE EFFORT

More emphasis on lightning safety has occurred during this decade. This emphasis has been a collaborative effort between private and governmental organizations whose prime mission is lighting safety (Table 1). A "lightning safety awareness week", began in 2000, is now held annually and is hosted on the following NOAA website:
www.lightningsafety.noaa.gov

Table 1. Active organizations associated with NOAA Lightning Safety Week.

ORGANIZATION	URL
Lightning protection Institute	www.lightning.org/
National Lightning Safety institute	www.lightningsafety.com/
Lightning Safety Alliance	www.lightningsafetyalliance.com/
Struck by Lightning	www.struckbylightning.org/
NOAA	www.lightningsafety.noaa.gov
45th Weather Squadron	none
Lightning Injury Research	tigger.uic.edu/labs/lightninginjury/

3. MOTIVATION FOR CHILDRENS LIGHTNING SAFETY.

Lightning statistics from 1995 through 2006 show that children (ages 0 - 20) make up ~21% of the fatalities across the United States (Figure 3). Regional statistics show that these values can be even larger. A study by Lushine et. al., (2005) showed that over 34% of the fatalities in Florida occurred to children in the age group between 0 and 20.

Table 2 shows the 1995 through 2006 lightning fatality data normalized by percent of population versus age. It is interesting that the largest change in the normalized data occurs between the 0-9 age group to 10-19 age group. Presumably this increase is due to children being left to do more outdoor activities unsupervised by adults as they enter their teen years, but they still do not have the understanding and/or training to avoid the lightning hazard. This suggests that lightning safety education would be most effective before 10 years old, especially since kids are more teachable at these younger ages.

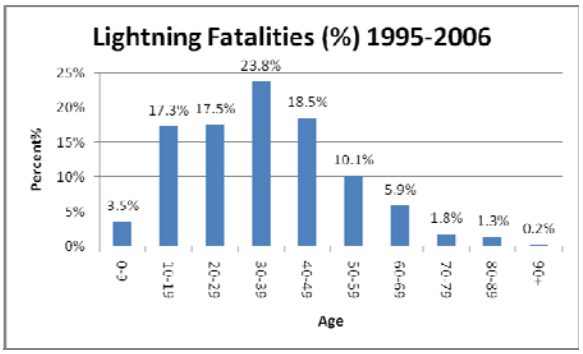

Figure 3. USA Lightning fatalities (%) by age group. There have been a total of 542 known lightning fatalities in the United States between 1995 and 2006.

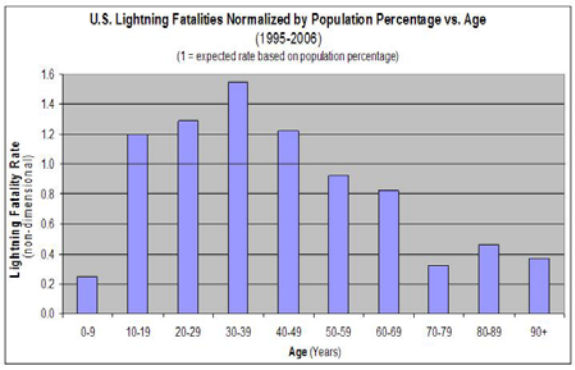

Figure 4. Lightning fatalities normalized by population. A value = 1 means the percent of lightning fatalities is as expected from the percent of population of that age group, > 1 means more lightning fatalities than expected from the percent of population, and < 1 means less lightning fatalities than expected (Roeder, 2008).

3.1. LEON THE LIGHTNING SAFETY LION

Leon the Lightning Lion is currently being used to promote lightning safety in NOAA's (and its partners') ongoing program to educate children about lightning safety. Leon the Lightning Lion was originally developed by the Lightning Safety Alliance, further developed with StruckByLightning.Org, and is now used as the official mascot of NOAA's lightning safety awareness week.

A web based lightning safety game using an animated Leon the Lightning Lion has been developed by meteorologists at the NWS in Pueblo, CO in collaboration with the working group of lightning safety awareness week. This Adobe Flash™ web based game provides an interactive method to teach young children about lightning safety. The game consists of showing a sequence of photographs and asking the question: "Would this location (or activity) be safe if lightning were occurring?" Some examples include a camping tent, an outdoor playground, a school building, an SUV, a corded video game console, a corded and cordless telephone, etc. (Figure 5). The user is then asked to provide their answer by clicking on either the "Safe" or "Not Safe" button. If answered correctly, Leon provides animated feedback by clapping his hands. If an incorrect answer is chosen which puts Leon in danger, Leon is "zapped" by lightning and his cartoon-like skeleton briefly appears each time the lightning bolt strikes him. If an incorrect answer is chosen for a "Safe" activity or location, a disappointed Leon tells you your answer is incorrect. After each question, feedback is provided giving a concise reason of why an activity or location is "Safe" or "Not Safe". This allows children to learn as they progress through the game. The game keeps score with the percent correctly answered displayed upon completion. This game has been used with great success at the NWS display at the Colorado State Fair and at school safety talks. This game will be available to play during poster session 2 of this conference. A MicroSoft PowerPoint™ version of the game is currently downloadable from the NOAA NWS Lightning Safety webpage for kids located at www.lightningsafety.noaa.gov/kids.htm. We plan to make the Adobe Flash™ version of the game available at the NOAA website in the near future.

Figure 5. An image from Leon the Lightning Lion Game.

3.2 LIGHTNING SAFETY POSTERS

Lightning awareness safety posters featuring Leon the Lightning Lion have also been completed. These posters discuss general lightning safety, swimming lightning safety, and lightning safety for outdoor sports, with corresponding slogans from Lushine et al. (2005). The Leon the Lightning Lion posters are shown in Figures 6-8. Additional lightning awareness posters featuring major sports stars have also been produced, along with other general lightning awareness posters. These resources can be downloaded from the NOAA lightning safety website and/or the StruckByLightning.Org website.

Figure 6. Leon the Lightning Lion poster for general lightning safety.

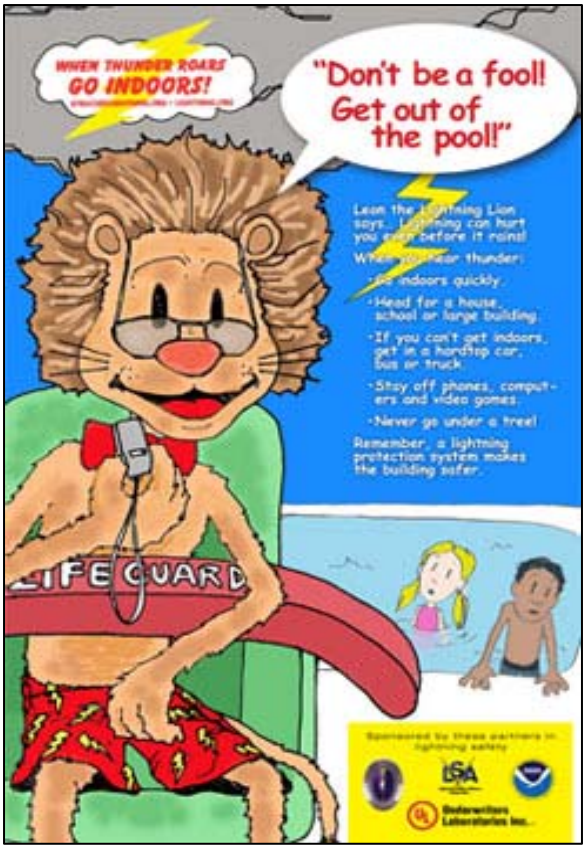

Figure 7. 'Leon' poster for swimming lightning safety.

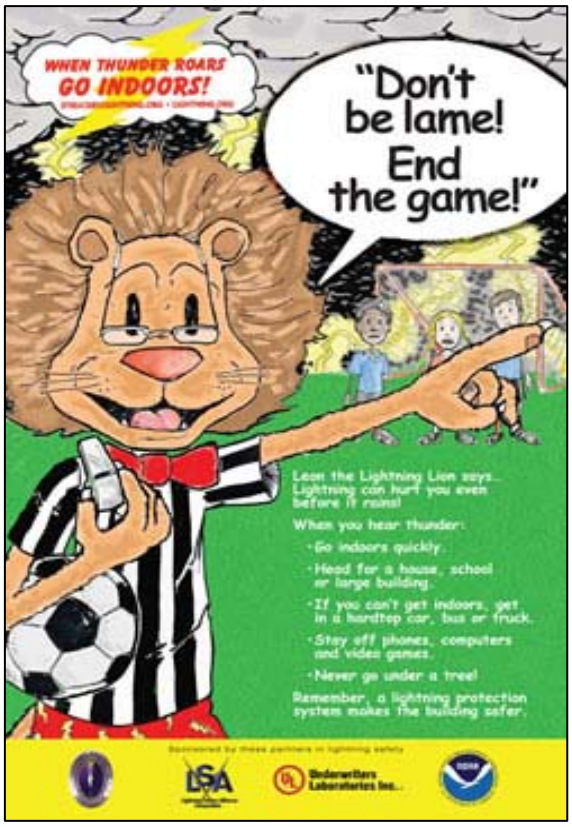

Figure 8. 'Leon' poster for outdoor sports lightning safety.

3.3. PUBLIC SERVICE ANNOUNCEMENTS

A Public Service Announcement (PSA) featuring Leon is also available from the NOAA lightning safety website. This 30 second video discusses what you should do if you are outside and lightning develops in the area. Additional PSAs (both video and audio) are also available to download.

3.4 ADDITIONAL CHILDRENS RESOURCES

Additional Children's resources on the NOAA website include crossword puzzles, "wordfind" games, pre-school lesson plan, and coloring books including "Leon the Lightning Safety Lion" (Fig. 9), "Billy, Maria, and the Thunderstorm" and "Lightning Ahead from Owlie Skywarn". Additional websites specializing in lightning safety for children are shown in Table 2.

Table 2. Websites for lightning safety for children.

NAME	URL
Kids' Lightning Safety	www.kidslightning.info (aka "Sabrina's website")
Kidstorm	www.skydiary.com/kids/lightning.html
National Severe Storms Lab	www.nssl.noaa.gov/edu/bm (downloadable coloring books on thunderstorm safety and other topics)
Red Cross	www.redcross.org/disaster/masters ("masters of disasters" curriculum)

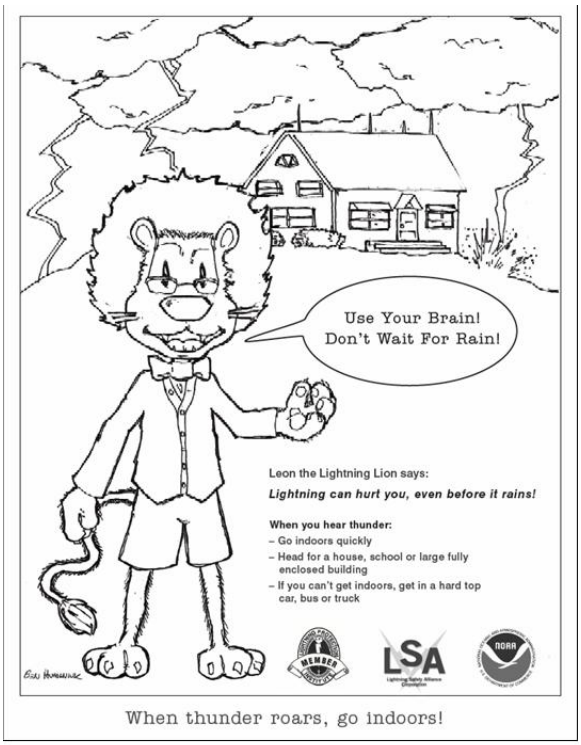

Figure 9. Coloring page for Leon the Lightning Lion.

3.5 TEACHERS RESOURCES

The NOAA Lightning Safety website has an entire section devoted to Teachers Resources related to lightning safety. These include lesson plans, slide shows, and narrated Real Media ™ presentations.

4. CONTINUING THE TREND ON REDUCING LIGHTNING CASUALTIES

Nearly all lightning casualties occur outdoors (Curran et al 1997). Based on this, ***No place outside is safe when thunderstorms are in the area***. Likewise, the most important and simplest rule regarding lightning safety for children is "***If you hear thunder, go into a substantial building or into an enclosed automobile***". It is important to emphasize that any lighting is dangerous, no matter how infrequent the strikes are. Studies in Colorado (Hodanish 2006) have shown numerous people who are struck by lightning are struck by thunderstorms which produce very infrequent cloud to ground lightning activity (1 flash every 2-3 minutes). This is consistent with other studies (Lenvengi, 2005, and Holle et al., 1993). The lightning safety community strongly encourages all children at the grade school level be taught that if they are outside and they hear thunder, that they should go indoors immediately. If children are taught lightning safety before their adolescent years, then it is likely that they will remember the proper lightning precautions as they become adults.

5. SUMMARY

Lightning safety remains one of the leading sources of storm deaths. Public education is proving effective in reducing lightning fatalities in the U.S., but more work remains to be done. The lightning death demographics strongly suggest that the most gain will result from education focused on children 10 years old and younger. Several resources for lightning safety outreach to this age group were presented, especially those featuring the new lightning safety mascot Leon The Lightning Safety Lion. A good slogan for teaching lightning safety to children is, as Leon The Lightning Lion says, '***When Thunder Roars, Go Indoors!'***

6. REFERENCES

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